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Application No. 10/603,263

DETAILED RESPONSE TO ACTION RESPONSE



ITEM 1

I have cancelled claims 1-20 and submitted new ones, which do not repeat the informalities of the original claims.

ITEM 2

I provide comments in this document that explain why previous patent applications do not disclose the invention.

ITEM 3

Regarding Claim 1, the observation is made that Mujtaba discloses a TDD time-slotted CDMA technique, which may be used with electronically steered beams. This does not anticipate the invention, which even though it employs TDD, it does not employ time slotting. Time slotting would be more restrictive than the TDD access method disclosed in the invention. Time slotting requires transmissions to start and end at slot boundaries. In contrast, the invention allows transmissions to start in continuous time. A designated channel release time is required only for uplink transmissions, not for downlink. According to the invention, stations may stop transmitting at any time before the required uplink channel release time, and the AP may start transmitting when all stations cease transmitting. According to the invention, the AP may stop transmitting at any time.

Time slotting does not meet the requirement of the invention for the AP to occupy all beams while transmitting. If different time slots are assigned to downlink reservations on different beams, all downlink transmissions will not terminate simultaneously, a requirement of the invention that helps avoid collisions between uplink and downlink transmissions in different beams.

The action report cites Para. 25, line 17, in claiming that Mujtaba discloses TDD in a way that reduces channel capture. The cited text says: "uplink and downlink portions of the system are separated using time slots." The action report also cites the description of Fig. 10, in Para. 29, which states: "a different duplexing mechanism, i.e., a time division ... is used to separate the uplink and downlink portions of the system. FIG. 10 illustrates the duplexing used in the TDD time-slotted CDMA technique. One or more of the time slots are assigned to the downlink, while others are assigned to the uplink." This text has been interpreted by the action report as "requiring all stations engaged in uplink transmission to release the channel at the same time, causing the channel to become idle at that time, and thus preventing capture of the channel by uplink transmissions". I believe, however, that this is not the proper interpretation of Mujtaba's disclosures in the cited text. Uplink channel capture cannot not be alleviated through the use of time slots, as a different number of time slots may be assigned to different uplink transmissions, which would cause different stations engaged in uplink transmission to not release the channel at the same time.

ITEM 4

Claim 2 was rejected on the basis of the use of TDD time-slotted CDMA by Mujtaba. Claim 2 deals with the termination of downlink transmission on multiple beams. The invention ensures that they all such transmissions end simultaneously.

TDD time-slotted CDMA would not necessarily cause the requirement of Claim 2 to be met. The AP may transmit on a different number of time slots for different beams. Furthermore, the requirement of Claim 2 can be met by means other than time slotting. The AP can take as long as it needs to complete its downlink transmissions, and need not end its transmissions on a time slot boundary.

ITEM 5

Regarding Claim 7, the examiner says that in Para. 26, lines 28-30, Mujtaba discloses that the technique is "time-slotted" in that the beams are steerable, such that different beams can be activated in different time slots. The cited text thus implies that beams delivering downlink traffic are activated at different times. One would conclude, therefore, that Para. 20 does not disclose that activation of the beams must be coordinated to terminate simultaneously for downlink transmissions. Therefore, Mujtaba does not anticipate Claim 7 of the invention.

ITEM 6

I provide comments in this document that explain why previously patent applications do not make the invention obvious to one having ordinary skill in the art.

ITEM 7

Claims 3, 4, 6, 15 and 16 are rejected because, according to the action report, it is believed that the CSMA-like protocol described by Eastmond (US Patent No. 6,088,337) when applied to modify Mujtaba's TDD method would make the invention obvious.

Applying the medium access method disclosed by Eastmond to Mujtaba's channel duplexing method would not make the invention obvious. In the cited patent by Eastmond, the access point schedules the time-slot use on the two directions. Specifically, in col. 8, lines 6-13, Eastmond describes a scheduler [residing in the AP] that directs what non-AP station – referred to by Eastmond as a peripheral device – is to transmit or receive on the next block (i.e. time slot). Eastmond allows for contention-based access, but contention can occur only among the stations [see col. 28, line 36 – col. 29, line 29]. This notwithstanding, the start and end of both uplink and downlink transmission is specified by the AP. This makes the Eastmond medium access protocol different from the protocol in this invention. In this invention, both the AP and the stations may start or end transmissions at times that are not specified.

Hence, Eastmond's patent, either alone or in conjunction with Mujtaba's patent application, does not make the invention obvious.

ITEM 8

It is correctly observed in the action report that Mujtaba does not disclose determining whether the channel idle is through timers maintained at the non-transmitting stations and set to the duration value indicated upon reservation of the channel. This is because Mujtaba considers a system where channels are assigned by an entity, rather than accessed in a distributed manner by the AP and stations through a contention-based protocol that relies on the channel being free of transmissions in the competing direction.

The above-cited patent by Eastmond discloses the use of timers to regulate the asynchronous transfer process. None of the disclosed timers, however, are employed by the medium access control protocol in order to determine whether the channel is free of transmissions.

TP203 in Eastmond's patent, which is mentioned by the examiner specifically, is the maximum time between assigned blocks for data segments. If this time is "exceeded the peripheral must abort the transfer and either retry or drop the packet." [Col. 32, lines 31-33] The invention uses a different timer, for a different purpose. The timer is used to keep track of how long the channel is busy. A contending non-AP station, or the access point, sets a timer to the duration of a sequence of transmissions. The timer setting is extracted by all contending entities from the transmitted frame(s). When the timer expires, the medium is considered idle, and medium is available for transmissions by the stations or AP.

In the systems considered in the invention, the access point (or a station) can transmit only if the channel is free of transmission on the uplink (or downlink). The AP does not control when this occurs. In contrast, in the systems described by Eastmond, the access point tells the stations when to transmit and for how long. According to Eastmond, "the scheduler is a sub-function of the DMF running on the access point. It assigns the appropriate number of blocks to support the data transfer and requisite retries." [Col. 29, lines 37-40] Because, in Eastmond's protocol, the AP controls the time stations finish their uplink transmissions and the channel becomes available for downlink transmission uplink channel capture does not arise in the systems considered by Eastmond. Eastmond's method leads to less efficient channel use and requires a more complex implementation of the AP relative to this invention.

ITEM 9

It is correctly observed that Mujtaba does not disclose the access point transmitting dummy frames on certain beams so as to cause transmission on all beams to terminate simultaneously. Eastmond's disclosure of padding the final data segment with fill bits, which is cited in the action report, does not help meet this requirement.

Eastmond's padding disclosure (col. 31, lines 24-40) ensures only that complete blocks are formed, and ensures that all blocks terminate at the same time. In a system with multiple beams emanating from the AP, such as that described by Mujtaba, applying Eastmond's padding disclosure would not meet the requirement of Claim 6 that transmission by the access point on all beams terminate simultaneously. The access point in the combination system may transmit a different number of blocks on different beams, causing downlink transmissions to terminate at different times. Also, according to the combination of the Mujtaba-Eastmond disclosures, downlink transmissions must terminate at a pre-determined time such as the boundary of a "block" (i.e. time slot), which would be more restrictive than with the method of this invention.

ITEM 10

Claims 15 and 16: Mujtaba does not disclose timing acknowledgements of uplink frames. The transmit-and-wait (for acknowledgement) scheme disclosed by Eastmond [col. 2, lines 36-37] is different from the acknowledgment procedure in the invention. According to Eastmond's acknowledgement policy, acknowledgement of successful receipt of a frame is required before the next frame is transmitted. [Col. 29, line 32 – col. 30, line 12] Unlike in Eastmond's method, the acknowledgement policy in the invention does not require the source to wait for an outstanding acknowledgement before it transmits another frame. A station that has more than one frame to transmit may transmit a second frame before receiving an acknowledgement to the first frame. The need for a special acknowledgement mechanism arises because the special coordination requirements of the protocol in the invention increase the time following the reception of a frame when acknowledgements can be sent. Furthermore, Mujtaba's TDD method is different from the method in the invention and applies to different systems. Hence, the combination of Mujtaba's TDD method and Eastmond's acknowledgment method would not make the Claims 15 and 16 obvious.

ITEM 11

Claims 5 and 10: Mujtaba does not disclose synchronizing the clocks of the station and requiring the times at which stations engaged in uplink transmissions to release the channel to conform to a previously designated schedule. Serinken's synchronization method [U.S. Patent No. 5,864,544] limits transmission to start at the signaled times on both the uplink and downlink. In this invention, downlink transmission may occur prior to the required uplink channel release time if all uplink transmissions end before that time. According to Serinken's method, the AP would have to wait until signaled before transmitting downlink. Furthermore, Mujtaba's TDD method is different from the method in the invention and applies to different systems. Hence, the combination of Mujtaba's TDD method with Serinken's method would not make Claims 5 and 10 obvious.

ITEM 12

Claims 11 and 12: Mujtaba does not disclose achieving synchronization of the clocks of all stations with the same cell by requiring some or all stations to extract time information from signals generally available outside the network, as observed in the action report. Serinken proposes an outside timing signal that enables the direction of transmission to be changed in a synchronized manner. As mentioned above, Serinken's method limits transmission to start at the signaled times on both the uplink and downlink. In this invention, downlink transmission may occur prior to the required uplink channel release time if uplink transmissions end. According to Serinken's method, the AP would have to wait until signaled before transmitting downlink. Furthermore, Mujtaba's TDD method is different from the method in the invention and applies to different systems. Hence, the combination of Mujtaba's TDD method with Serinken's method would not make Claims 5 and 12 obvious.

ITEM 13

Claim 8: Mujtaba in combination with Serinken do not disclose having release schedules specified and distributed previously, and one chosen based on time of day, as observed in the action report. Charas [U.S. Patent No. 6,549,531] discloses the existence of time-slot sharing schemes that efficiently allocate time slots among adjacent cells for interference reduction and meeting demand as a function of day, as dynamic channel assignment (DCA) algorithms do. In his case, the resource allocated is TDMA time-slots instead of frequencies. However, these schemes are not proposed for TDD purposes – the allocation of time slots between uplink and downlink directions –, which is of concern in this invention. Moreover, these schemes deal with time slotted transmissions, which as in Serinken's method, limit transmission to start at fixed times on both the uplink and downlink. In this invention, downlink transmission may occur prior to the required uplink channel release time if all uplink transmissions end. Furthermore, neither Serinken's method nor Mujtaba's TDD method makes what is claimed in the invention obvious. Hence, the combination of Mujtaba's TDD method with Serinken's and Charas's methods would not make Claim 8 obvious.

ITEM 14

Claim 9: Mujtaba in combination with Serinken do not disclose having several release schedules specified and distributed previously, and one chosen based on network conditions, as observed in the action report. As mentioned above, Charas discloses the existence of time-slot sharing schemes that efficiently allocate time slots among adjacent cells for interference reduction and meeting demand, which could be adapted to respond to changing network conditions. However, these schemes are not proposed for the allocation of time slots between uplink and downlink directions, which is of concern in this invention. Moreover, these schemes deal with time slotted transmissions, which as in Serinken's method, limit transmission to start at fixed times on both the uplink and downlink. In this invention, downlink transmission may occur prior to the required uplink channel release time if all uplink transmissions end. Furthermore, neither Serinken's method nor Mujtaba's TDD method make what is claimed in the invention obvious. Hence, the combination of Mujtaba's TDD method with Serinken's and Charas's methods would not make Claim 9 obvious.

ITEM 15

Claims 13 and 14: Mujtaba in combination with Serinken do not disclose achieving synchronization of the clocks of all stations by extracting time reading from radio signals intended for national time synchronization, as observed in the action report. Holtz [Pub. No. US 2003/00011880] presents a method for editing and distributing media throughout a network, which is not related to the method in this invention. Furthermore, neither Serinken's method nor Mujtaba's TDD method makes what is claimed in the invention obvious. Hence, the combination of Mujtaba's TDD method with Serinken's and Charas's methods does not make Claims 13 and 14 obvious.

ITEM 16

Claim 17 was rejected over Mujtaba in view of Serinken and in view of Admitted Prior Art. However, the report does not offer any method from Serinken patent in explaining the reason why. The report mentions Eastmond's method, which as explained before is different from this invention in many ways including the acknowledgement mechanism. The described prior art is different than the invention and applies to a different system. Neither Serinken's method nor Mujtaba's TDD method anticipate what is claimed in the invention. Hence, the combination of Mujtaba's TDD method with Serinken's and Charas's methods does not make Claim 17 obvious.

ITEM 17

Claims 18-20 were rejected over Mujtaba in view of Eastmond and in view of Admitted Prior Art. The described prior art is different than the invention and applies to a different system. The Block Ack of the IEEE 802.11e standard requires prompting with a BlockAck Request. In this invention the compound acknowledgement is sent without prompting. Neither Eastmond's method nor Mujtaba's TDD method contain methods that appear in the invention, the combination of Mujtaba's TDD method with Serinken's and Charas's methods does not make Claims 18-20 obvious.